

CLAIMS

What is claimed is:

1 1. A method of compressing a video or image,
2 comprising the steps of:
3 defining a configuration space that models an
4 optimal bit allocation problem of a data compression
5 process, the configuration space defining nodes and
6 transitions between the nodes, the nodes corresponding to
7 the selection of respective quantizers for respective
8 features of a data stream, a path defined by a set of
9 transitions each connected at respective ones of said nodes
10 to another one of said set, said path joining a start node
11 and an end node and having a total cost corresponding to a
12 sum of costs of said transitions of said set;
13 propagating least-cost waves through said
14 configuration space by budding, responsively to a space-
15 variant metric, such that a first path of lowest found cost
16 is identified through said configuration space joining said
17 start node and said end node; and
18 applying the quantizers corresponding to said
19 nodes lying on said first path to a first set of data to be
20 compressed by said data compression process.

1 2. A method as in claim 1, further comprising
2 the step of repeating said step of propagating such that a
3 second path of lowest found cost is identified and
4 repeating said step of applying in compressing a second set
5 of data to be compressed by said data compression process.

1 3. A method of compressing a video or image,
2 comprising the steps of:

3 defining a configuration space that models an
4 optimal bit allocation problem of a data compression
5 process, the configuration space defining nodes and
6 transitions between the nodes, the nodes corresponding to
7 the selection of respective quantizers for respective
8 features of a data stream, a path defined by a set of
9 transitions each connected at respective ones of said nodes
10 to another one of said set, said path joining a start node
11 and an end node and having a total cost corresponding to a
12 sum of costs of said transitions of said set;

13 propagating least-cost waves through said
14 configuration space by budding, responsively to a space-
15 variant metric, such that a first path of lowest found cost
16 is identified through said configuration space joining said
17 start node and said end node;

18 repeating said step of propagating such that a
19 second path of lowest found cost is identified; and
20 comparing said costs of said first and second
21 paths and applying the quantizers corresponding to said
22 nodes lying on a lower cost one of said first and second
23 paths in compressing input data to be compressed by said
24 data compression process.

1 4. A method as in claim 3, wherein said steps
2 of repeating and comparing are performed conditionally
3 based upon an allowed time interval for finding an optimal
4 least cost path.

1 5. A method as in claim 3, wherein said input
2 video data includes video data and said cost is one of a
3 distortion of images of said video data and a bit rate of a
4 data stream resulting from said step of applying.

1 6. A data compression device, comprising:
2 a processor connected to receive a raw data
3 stream and output a compressed data stream;
4 said processor being programmed to determine
5 optimal quantizers by budding nodes of a configuration
6 space that models an optimal bit allocation problem of a
7 data compression process, the nodes corresponding to the
8 selection of respective quantizers for respective features

9 of a data stream, a path defined by a set of transitions
10 each connected at respective ones of said nodes to another
11 one of said set, said path joining a start node and an end
12 node and having a total cost corresponding to a sum of
13 costs of said transitions of said set;

14 said budding including propagating least-cost
15 waves through said configuration space responsively to a
16 space-variant metric such that a path of lowest found cost
17 is identified through said configuration space joining said
18 start node and said end node;

19 said processor being programmed to apply the
20 quantizers corresponding to said nodes lying on said path
21 of lowest cost in compressing said raw data.

1 7. A data compression device, comprising:

2 a processor connected to receive a raw data
3 stream and output a compressed data stream;

4 said processor being programmed to determine
5 optimal quantizers by budding nodes of a configuration
6 space that models an optimal bit allocation problem of a
7 data compression process, the nodes corresponding to the
8 selection of respective quantizers for respective features
9 of a data stream, a path defined by a set of transitions
10 each connected at respective ones of said nodes to another

11 one of said set, said path joining a start node and an end
12 node and having a total cost corresponding to a sum of
13 costs of said transitions of said set;

14 said budding including propagating least-cost
15 waves through said configuration space responsively to a
16 space-variant metric such that a first path of lowest found
17 cost is identified through said configuration space joining
18 said start node and said end node;

19 said processor being programmed to further
20 propagate further cost waves to identify a second path of
21 lowest found cost and to compare said costs of said first
22 and second paths and apply the quantizers corresponding to
23 said nodes lying on a lower cost one of said first and
24 second paths in compressing said raw data.

1 8. A method of allocating bits for optimal
2 rate/distortion performance in digital data compression,
3 comprising:

4 determining a set of interconnected choices of
5 quantizers for each of a set of portions of a data stream
6 in accord with said digital data compression;

7 defining a starting one of said choices and
8 propagating least-cost waves beginning with said starting

9 one until a path defining all necessary quantizers is
10 found; and

11 implementing a data compression based upon at
12 least some of said quantizer choices defined by said path.

1 9. A method as in claim 8, wherein said step of
2 determining includes determining a set of interconnected
3 choices of quantizers for each of set of portions of a
4 video data stream.

1 10. A method as in claim 9, wherein said
2 quantizers include a quadtree decomposition of a video
3 image.

1 11. A method as in claim 9, wherein said
2 quantizers include a quantizer for representing a motion
3 vector field.

1 12. A method as in claim 8, wherein said
2 quantizers include a quantizer for quantizing differences
3 between values in said data stream.

1 13. A device for allocating bits for optimal
2 rate/distortion performance in digital data compression,
3 comprising:

a processor linked to a data stream and
programmed to determine a set of interconnected choices of

quantizers for each of a set of portions of a data stream
in accord with said digital data compression;

said processor being further programmed to define
a starting one of said choices and to propagate least-cost
waves beginning with said starting one until a path
defining all necessary quantizers is found; and

said processor being further programmed to
implement a data compression process based upon at least
some of said quantizer choices defined by said path.

14. A device as in claim 13, wherein said data
stream is a video data stream.

15. A device as in claim 14, wherein said
quantizers include a quadtree decomposition of a video
image.

16. A device as in claim 14, wherein said
quantizers include a quantizer for representing a motion
vector field.

17. A device as in claim 13, wherein said
quantizers include a quantizer for quantizing differences
between values in said data stream.

18. A device for allocating bits for optimal
rate/distortion performance in digital data compression,
comprising:

4 a processor linked to a data stream and
5 programmed to determine a set of interconnected choices of
6 quantizers for each of a set of portions of a data stream
7 in accord with said digital data compression;

8 said processor being further programmed to define
9 a starting one of said choices and to propagate least-cost
10 waves beginning with said starting one until a first path
11 defining all necessary quantizers is found;

12 said processor being further programmed to
13 propagate least-cost waves beginning with a lowest cost
14 incomplete path until a second path defining all necessary
15 quantizers is found;

16 said processor being further programmed to
17 implement a data compression process based upon at least
18 some of said quantizer choices defined by a lowest cost one
19 of said first and second paths.

1 19. A device as in claim 18, wherein said data
2 stream is a video data stream.

1 20. A device as in claim 19, wherein said
2 quantizers include a quadtree decomposition of a video
3 image.

1 22. A device as in claim 18, wherein said
2 quantizers include a quantizer for quantizing differences
3 between values in said data stream.